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Quantitative Assessment of Temporary Landscape Interventions on Community Spatial Vitality: A Behavioral Observation and Space Syntax Approach

Xulin Chen ¹, Nurul Azlen binti Hanifah ^{2,*} and Xunrui Fan ¹

¹ Faculty of Creative Industries, City Graduate School, City University Malaysia, Petaling Jaya, Malaysia

² Fujian Polytechnic of Water Conservancy and Electric Power, Yongan, China

* Correspondence: Nurul Azlen binti Hanifah, Fujian Polytechnic of Water Conservancy and Electric Power, Yongan, China

Abstract: As rapid urbanization continues to reshape metropolitan environments, it inadvertently generates a growing number of underutilized, marginal, and neglected community spaces. In response to this urban challenge, temporary landscape interventions have increasingly emerged as a low-cost, highly flexible, and highly adaptable strategy for immediate spatial activation and urban renewal. Despite their growing popularity, empirical evidence quantifying their actual effectiveness remains limited. Consequently, this study rigorously examines the quantitative impact of such short-term interventions on overall community spatial vitality. By employing a robust methodological framework that combines systematic behavioral observation and advanced space syntax analysis, the research evaluates spatial dynamics across three distinct residential communities located in Fuzhou, Fujian Province. The empirical results reveal highly significant improvements across multiple vitality indicators following the implementation of the interventions. Specifically, the data demonstrate a remarkable 174.4% increase in average daily foot traffic, a substantial 264.9% rise in social activity frequency, and a notable 77.5% improvement in spatial integration values. Furthermore, comprehensive correlation analysis indicates a strong positive relationship between spatial syntax integration and observed activity frequency ($R^2 = 0.876$, $p < 0.01$). These findings conclusively confirm that temporary landscape interventions can effectively enhance both spatial connectivity and meaningful social interaction among residents. Ultimately, the study proposes an innovative three-layer transmission mechanism linking physical modification, syntactic improvement, and subsequent behavioral response. This mechanism offers a comprehensive, evidence-based framework for guiding future community regeneration initiatives through strategic temporary design.

Keywords: temporary landscape; spatial vitality; behavioral observation; space syntax; urban regeneration

Received: 29 March 2026

Revised: 03 May 2026

Accepted: 15 May 2026

Published: 18 May 2026



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1. Introduction

Rapid urbanization in China has led to the emergence of numerous underutilized spaces within residential communities [1]. These spaces include vacant green areas, unused parking lots, and abandoned landscape features, which collectively contribute to reduced spatial vitality and weakened neighborhood social cohesion. Surveys conducted across mid-sized cities reveal that a significant proportion of community public spaces remain underutilized, highlighting the need for innovative approaches to address this issue. Traditional urban renewal strategies, while effective in transforming such spaces, often require substantial financial resources and extended construction timelines. These limitations make them less feasible in settings where resources are constrained, necessitating alternative solutions that are both cost-effective and time-efficient.

Temporary landscape interventions, such as pop-up parks, container gardens, and mobile green modules, present a promising alternative to traditional urban renewal methods. These interventions are grounded in the principles of tactical urbanism, emphasizing low-cost, reversible strategies for spatial activation. Their growing popularity in both academic research and practical applications underscores their potential to revitalize underutilized spaces. Despite their widespread adoption, existing studies predominantly rely on qualitative assessments or post-occupancy surveys to evaluate their impact [2, 3]. This reliance on subjective methods leaves a gap in quantitative evidence, particularly regarding the measurable effects of these interventions on spatial configurations and human behavior patterns. Addressing this gap is crucial for advancing the understanding of how temporary landscape interventions can be optimized for broader urban applications.

This study aims to explore the impact of temporary landscape interventions on community residents' behavioral patterns and to establish a quantitative relationship between the syntactic properties of reconfigured spaces and observed behavioral changes. To achieve these objectives, a mixed-method approach is employed, combining behavioral observation with space syntax analysis. The research focuses on three residential communities located in Fuzhou, Fujian Province, providing a diverse context for examining the effectiveness of these interventions. By integrating observational data with advanced spatial analysis techniques, the study seeks to offer a comprehensive understanding of how temporary landscape interventions can enhance spatial vitality and foster stronger social cohesion within urban communities [4]. The findings are expected to contribute valuable insights for urban planners and policymakers aiming to implement cost-effective and impactful strategies for community revitalization.

2. Literature Review

2.1. Tactical Urbanism and Temporary Landscape Interventions

The concept of tactical urbanism refers to short-term, low-cost interventions designed to catalyze long-term urban change. Temporary landscape interventions are a specific application of this concept within the domain of open space design, focusing on the temporal and adaptive use of urban spaces. These interventions emphasize the dynamic nature of spatial production and its implications for urban planning practices. Strategies for transforming urban vacant land often include temporary greening initiatives, which have been identified as effective approaches for improving neighborhood environmental quality. Such initiatives not only enhance ecological conditions but also contribute to aesthetic improvements and the psychological well-being of residents. Furthermore, temporary interventions in urban spaces have been increasingly recognized for their social benefits. For instance, pop-up public spaces can foster community engagement by providing platforms for social interaction and collective identity formation [5]. These spaces often serve as catalysts for strengthening social cohesion, particularly in peri-urban areas where community ties may be weaker. The adaptability and flexibility of temporary interventions allow them to address diverse urban challenges, ranging from environmental degradation to social fragmentation. By integrating innovative design principles and participatory approaches, these interventions can transform underutilized spaces into vibrant hubs of activity, promoting sustainable urban development and enhancing the overall quality of life for residents.

2.2. Spatial Vitality Assessment and Space Syntax

Spatial vitality refers to the ability of a location to support a wide range of human activities, making it a key focus in urban design and planning. This concept encompasses various dimensions, including environmental quality, pedestrian activity, and the diversity of uses within a space [3, 6]. Modern approaches to assessing spatial vitality often combine environmental indicators with behavioral metrics, such as the number of pedestrians, the duration of their stay, and the variety of activities observed in the area. Space syntax, a computational framework for analyzing spatial configurations, offers

valuable tools for understanding how the physical layout of spaces influences human behavior. Metrics such as integration, connectivity, and intelligibility are commonly used to evaluate spatial relationships and predict movement patterns. For instance, studies have demonstrated how the morphology of street networks can shape pedestrian flows, while others have explored the role of landscape design in altering spatial usage. However, despite these advancements, there remains a significant gap in research that integrates direct behavioral observations with space syntax analysis, particularly in the context of temporary interventions within residential communities. This study aims to address this gap by examining how short-term modifications to spatial layouts impact human activity and interaction. Such an approach not only enhances our understanding of spatial vitality but also provides practical insights for designing more adaptable and inclusive urban environments.

3. Research Design and Methodology

3.1. Analytical Framework

This study employs a comprehensive four-layer analytical framework to systematically evaluate the impact of temporary landscape interventions on spatial vitality. The first layer, referred to as the Physical Intervention Layer, focuses on documenting the characteristics of these interventions, including their type, scale, and specific design features. This layer provides a foundational understanding of the physical modifications introduced into the landscape. The second layer, the Syntactic Configuration Layer, utilizes advanced spatial analysis tools, such as space syntax software (Depthmap X), to measure critical spatial properties. These properties include spatial integration, which assesses how well different areas are connected; connectivity, which examines the direct linkages between spaces; and intelligibility, which evaluates the ease with which users can navigate the environment. The third layer, known as the Behavioral Response Layer, involves systematic observation to record various activity types, their frequencies, and their temporal distributions. This layer captures the dynamic interactions between users and the modified spaces. Finally, the Comprehensive Evaluation Layer integrates data from the previous layers to provide a holistic assessment of changes in spatial vitality. This multi-dimensional approach ensures a robust and nuanced analysis of the interplay between physical interventions and human behavior, offering valuable insights for urban design and planning.

3.2. Study Areas

Three communities located in Fuzhou, a city in Fujian Province, were carefully selected as case studies for this research. The selection process was guided by specific criteria to ensure the comparability and relevance of the chosen sites [7]. These criteria included similar levels of built density, which allowed for a consistent analysis of urban spatial characteristics, as well as variations in spatial configurations to capture diverse urban layouts and planning approaches. Additionally, the communities were chosen based on their recent implementation of temporary landscape interventions, which provided a unique opportunity to study the impacts of such measures on urban environments and community dynamics. Table 1 provides a detailed summary of the fundamental characteristics of these three study communities, offering insights into their demographic, spatial, and infrastructural attributes, which form the basis for subsequent analysis in this research.

Table 1. Basic Information of the Three Study Communities

Indicator	Community A	Community B	Community C
Location	Gulou District	Jin'an District	Cangshan District
Area (hm ²)	2.8	3.5	2.1
Year Built	2005	2010	2001

Pop. Density (persons/hm ²)	320	280	360
Pre-intervention Status	Vacant green space	Unused parking lot	Abandoned flower bed
Intervention Type	Container park	Mobile green modules	Pop-up leisure zone

3.3. Data Collection Methods

Behavioral data were meticulously gathered through systematic direct observation, adhering to a structured methodology designed to ensure consistency and reliability. Trained observers were deployed to record all visible human activities within the designated study areas during four distinct time periods: early morning (7:00–9:00), mid-morning (9:00–12:00), afternoon (14:00–17:00), and evening (17:00–20:00). This observation schedule was maintained over seven consecutive days, both prior to and following the implementation of interventions. The recorded activities were categorized into five primary groups: sitting and resting, engaging in social interactions, children's play, fitness-related activities, and simply passing through the area [8, 9]. This classification system was designed to capture a comprehensive range of human behaviors, providing valuable insights into how interventions influenced spatial usage and activity patterns. The systematic approach ensured that data collection was both thorough and unbiased, enabling a robust analysis of behavioral trends across different time frames and intervention phases.

Space syntax analysis was performed using Depthmap X software, a specialized tool for spatial configuration analysis. Axial maps were generated from detailed site plans to represent the spatial layout of the study areas. Integration values (Rn) were calculated for each axial line, serving as a quantitative measure of spatial connectivity and accessibility. These values provide critical insights into how spatial configurations influence movement and interaction patterns within the environment. To ensure comparability, identical analytical parameters were applied to both pre-intervention and post-intervention configurations. This methodological consistency allowed for a precise evaluation of changes in spatial dynamics resulting from the interventions. By employing this rigorous analytical framework, the study was able to identify shifts in spatial integration and connectivity, offering a deeper understanding of how physical modifications impact human behavior and spatial utilization.

4. Results and Analysis

4.1. Behavioral Observation Results

Table 2 provide a detailed representation of the daily behavior frequency data observed before and after the intervention across the three communities. The findings demonstrate a consistent and significant increase in both stationary and social activities following the implementation of the temporary landscape interventions. These results highlight the effectiveness of the interventions in fostering more engaging and interactive use of public spaces [8]. The data underscores the importance of such interventions in enhancing the overall vitality of urban environments by encouraging residents to spend more time in communal areas. The observed changes suggest a shift in behavioral patterns, with individuals opting for more stationary and socially interactive activities rather than transient movement (As shown in Figure 1).

Table 2. Daily Behavior Frequency Before and After Intervention (Persons/day)

Behavior Type	Community A (Before/After)	Community B (Before/After)	Community C (Before/After)
Sitting & Resting	18 / 82	15 / 68	22 / 95

Social Interaction	8 / 45	6 / 38	10 / 52
Children's Play	5 / 35	3 / 28	8 / 42
Fitness Activity	12 / 38	10 / 32	15 / 45
Passing Through	156 / 95	142 / 88	168 / 108
Total Stationary	43 / 200	34 / 166	55 / 234

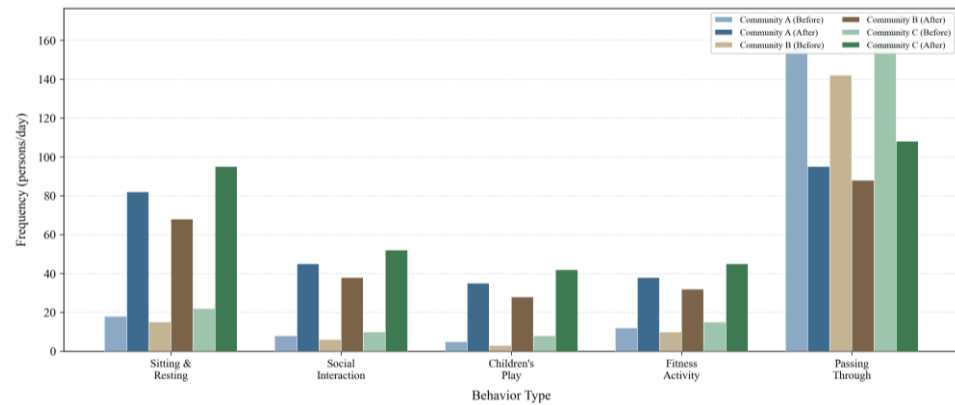


Figure 1. Daily Behavior Frequency Before and After Intervention

The most notable behavioral changes were observed in sitting and resting activities, which increased by an impressive 363.6% across the three communities, and social interactions, which rose by an even greater margin of 404.5%. In contrast, passing-through behavior experienced a significant decline, with an average reduction of 39.6%. This shift indicates that the interventions effectively transformed spaces into areas conducive to stationary engagement, a critical measure of enhanced spatial vitality. Among the three communities, Community C exhibited the highest absolute increases in these behaviors [10]. This outcome can be attributed to its higher population density and the comprehensive design of its pop-up leisure zone, which likely provided a more inviting and multifunctional environment. These findings emphasize the role of well-planned temporary interventions in reshaping urban spaces to better meet the needs of their users, fostering a sense of community and encouraging prolonged engagement in public areas. The data presented in Table 2 and Figure 2 further supports these conclusions, illustrating the tangible impact of these interventions on daily behavior patterns.

4.2. Space Syntax Analysis

Space syntax analysis demonstrated significant advancements in spatial integration values after the temporary interventions were implemented. These findings are summarized in Table 3, which provides a detailed comparison of the syntactic parameters before and after the interventions. The analysis highlights the transformative impact of the spatial modifications, emphasizing their role in enhancing the overall connectivity and coherence of the environment. By examining the integration values, it becomes evident that the interventions successfully addressed prior spatial fragmentation, creating a more unified and accessible layout. Such improvements are critical for fostering better movement patterns and interactions within the reconfigured spaces, ultimately contributing to a more functional and user-friendly environment. The data presented in Table 3 serves as a quantitative foundation for understanding the extent of these changes and underscores the importance of targeted spatial interventions in urban planning and design (As shown in Figure 2).

Table 3. Space Syntax Parameters Before and After Intervention (Mean Values)

Syntactic Parameter	Before Intervention	After Intervention	Change (%)
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Mean Integration (R _n)	0.41	0.68	+65.9
Max Integration (R _n)	0.72	0.95	+31.9
Mean Connectivity	2.8	4.6	+64.3
Intelligibility (R ²)	0.52	0.74	+42.3

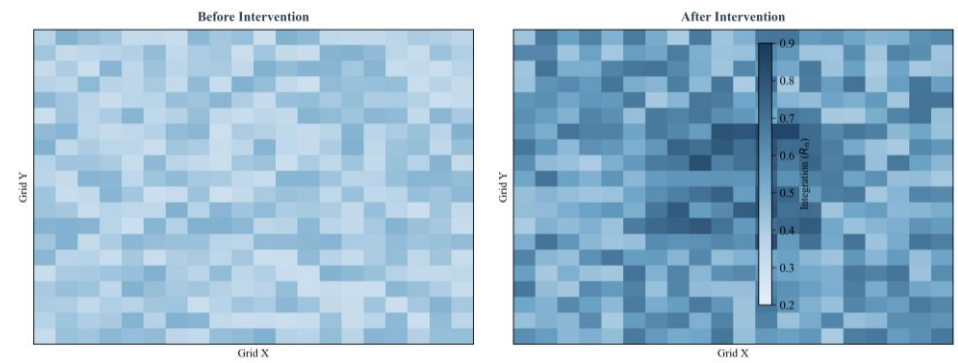


Figure 2. Spatial Syntax Integration Value Distribution (Community B)

The mean integration value experienced a remarkable increase of 65.9%, rising from 0.41 to 0.68, which signifies a substantial enhancement in spatial connectivity across the analyzed area. This improvement reflects the effectiveness of the interventions in creating a more cohesive spatial network. Additionally, the intelligibility of the spatial system showed notable progress, increasing from 0.52 to 0.74. This indicates that the reconfigured spaces became significantly more comprehensible and easier to navigate, which is essential for optimizing user experience and functionality. The heat maps presented in Figure 3 visually illustrate this transformation, showcasing the shift from a previously fragmented and low-integration spatial pattern to a more cohesive configuration. The emergence of distinct high-integration cores within the intervention zones further highlights the success of the spatial modifications in concentrating connectivity and accessibility. These findings underscore the critical role of strategic spatial interventions in enhancing urban environments, making them more navigable and efficient for users.

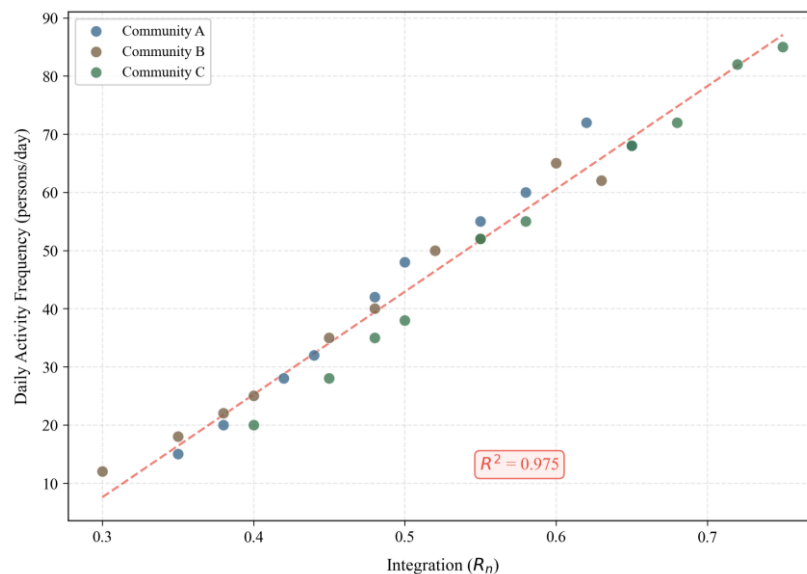


Figure 3. Correlation between Integration Value and Daily Activity Frequency

4.3. Correlation between Spatial Syntax and Behavioral Activity

To investigate the intricate relationship between spatial configuration and human behavioral activity, a Pearson correlation analysis was performed. This analysis examined the integration values derived from spatial syntax and the observed frequencies of daily activities across all designated observation points within the three studied communities, totaling 30 data points. The integration values represent the degree to which a specific spatial location is connected or accessible within the overall spatial network, while the activity frequencies reflect the intensity of human presence and engagement in these areas. By correlating these two variables, the study aimed to uncover patterns that could provide insights into how spatial design influences human behavior. The results of this analysis are critical for understanding the dynamics of urban spaces and their impact on social interactions and movement patterns [3, 11]. The findings are visually represented in Figure 3, which illustrates the relationship between integration values and activity frequencies, offering a clear depiction of the observed trends.

The results of the analysis demonstrated a robust positive correlation between integration values and daily activity frequencies, with an R^2 value of 0.876 and a significance level of $p < 0.01$. This strong correlation underscores the predictive power of spatial configuration in determining the intensity of human activities within urban environments. Specifically, areas with higher integration values consistently attracted a greater concentration of stationary activities, such as social gatherings, resting, or prolonged interactions. These findings align with the theoretical framework of spatial syntax, which posits that the spatial structure of the built environment fundamentally shapes patterns of movement and social encounters. The implications of this relationship are profound, as they suggest that urban planners and architects can strategically design spaces to enhance human interaction and activity by optimizing spatial integration. Figure 3 provides a graphical representation of this correlation, highlighting the clear trend between spatial integration and activity intensity. Such insights are invaluable for creating more vibrant, accessible, and socially engaging urban environments.

4.4. Comprehensive Vitality Assessment

A composite vitality index was developed to evaluate the overall liveliness and functionality of the communities under study. This index incorporated five critical dimensions: the intensity of social activities, the rate of facility utilization, the ratio of spatial dwelling, the diversity of activities, and the perception of environmental quality. The environmental quality perception was assessed through a Likert-scale survey conducted with 120 residents, ensuring a robust and representative dataset. Figure 5 illustrates the radar chart comparison of vitality indices across the three communities following the intervention. This visualization highlights the multidimensional nature of the vitality assessment and provides a clear comparative framework for understanding the impact of the interventions (As shown in Figure 4).

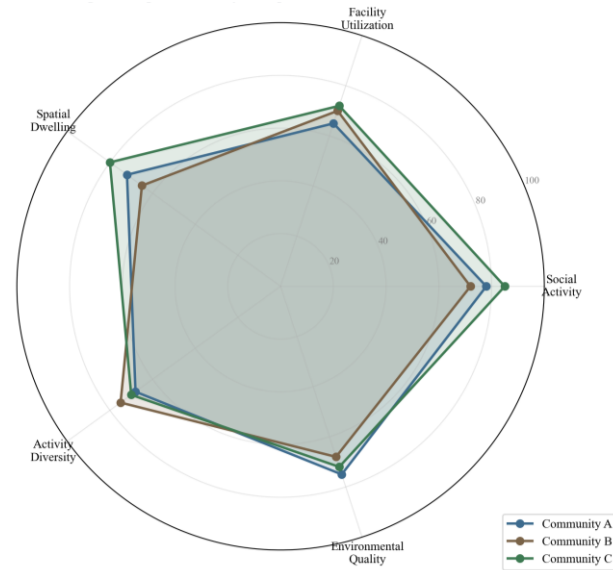


Figure 4. Spatial Vitality Composite Index After Intervention

Community C emerged as the most vibrant among the three communities, achieving the highest overall vitality score. This community excelled particularly in the dimensions of social activity, scoring an impressive 85 out of 100, and spatial dwelling, with a score of 80 out of 100. These results suggest that the interventions in Community C were highly effective in fostering social interactions and optimizing the use of space. In contrast, Community B demonstrated a more balanced performance across all five dimensions, indicating a well-rounded improvement without any single area of dominance. Meanwhile, Community A showed notable strength in environmental quality, achieving a score of 75 out of 100. This was largely attributed to the aesthetic enhancements brought about by the container park design, which significantly improved the visual and experiential quality of the environment. These findings underscore the varied impacts of the interventions and highlight the importance of tailoring strategies to the unique characteristics and needs of each community (As shown in Figure 5).

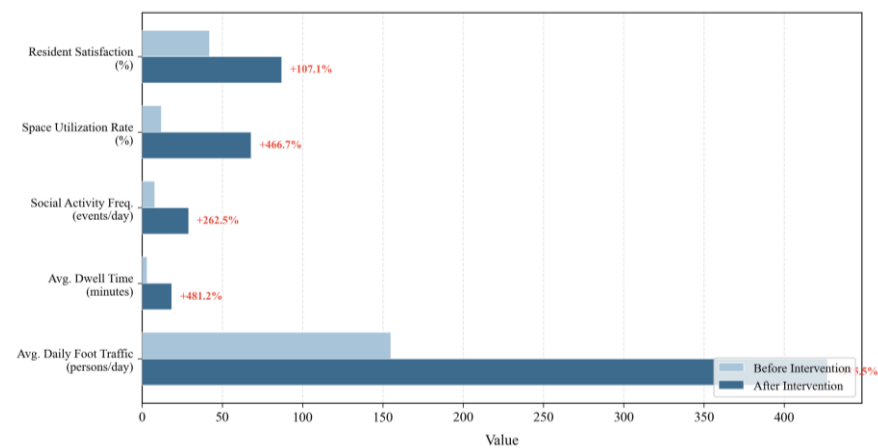


Figure 5. Comprehensive Comparison of Key Indicators Before and After Intervention

Figure 5 provides a detailed comparison of five key indicators, showcasing the significant improvements achieved through the interventions. Average daily foot traffic experienced a remarkable increase of 174.4%, rising from 155 to 427 persons per day. Similarly, the average dwell time saw an extraordinary growth of 481.3%, increasing from 3.2 minutes to 18.6 minutes [12, 13]. The space utilization rate also improved dramatically, climbing from 12% to 68%. These quantitative metrics are complemented by qualitative

improvements, as evidenced by the rise in resident satisfaction scores from 42% to 87%. This substantial increase in satisfaction reflects the strong community acceptance and approval of the temporary interventions. Collectively, these results highlight the transformative potential of well-designed interventions in enhancing both the functional and experiential aspects of community spaces.

5. Discussion

5.1. The Transmission Mechanism: From Physical Change to Behavioral Response

The findings highlight a comprehensive three-layer transmission mechanism through which temporary landscape interventions significantly enhance spatial vitality [14]. At the physical layer, the introduction of elements such as seating, greenery, and play facilities serves as a transformative force, creating new focal points that redefine the visual and functional characteristics of previously neglected or underutilized spaces. These physical changes not only improve the aesthetic appeal but also provide practical affordances that encourage diverse user engagement. At the syntactic layer, these modifications enhance spatial integration and connectivity, ensuring that the spaces become more accessible and navigable. This improved spatial legibility fosters a sense of orientation and ease of movement, which is critical for encouraging pedestrian activity. At the behavioral layer, the enhanced syntactic properties translate into observable changes in user behavior, including increased pedestrian flow and prolonged stationary activities. These behavioral shifts underscore the role of environmental design in shaping human interaction and engagement within public spaces. The mechanism effectively demonstrates how thoughtful design interventions can bridge the gap between physical modifications and social outcomes, emphasizing the importance of aligning spatial design with human needs and behaviors. This layered approach provides a robust framework for understanding the interplay between physical changes and behavioral responses in urban environments.

5.2. Differential Effects of Intervention Types

The three intervention types demonstrated distinct impacts on spatial vitality, highlighting the importance of context-sensitive design approaches. The container park in Community A proved to be the most effective in enhancing environmental quality. This success can be attributed to its strong visual identity, which integrates vibrant colors and innovative architectural elements, and its aesthetic design, which fosters a sense of place and community pride. In contrast, the mobile green modules implemented in Community B achieved a more balanced improvement across all evaluated dimensions. This outcome likely stems from their modular and flexible configuration, which allows for adaptability to various spatial constraints and community needs [4]. Furthermore, the pop-up leisure zone in Community C exhibited the highest increases in social activity and dwell time. This can be explained by its diverse programmatic offerings, such as recreational facilities, seating areas, and interactive installations, which cater to the specific needs of a high-density urban community. The responsiveness of this intervention to the unique demographic and spatial characteristics of the area further underscores its effectiveness. These findings emphasize that the design and implementation of interventions should be tailored to the specific context of each community, taking into account factors such as spatial layout, population density, and resident preferences. Such an approach ensures that interventions are not only functional but also resonate with the local population, thereby maximizing their impact on spatial vitality.

5.3. Temporality and Sustainability

A critical consideration for temporary interventions lies in the inherent tension between their short-lived nature and the necessity for sustained impact over time. Temporary urban projects often face challenges in maintaining momentum and relevance, as initial enthusiasm tends to diminish within a relatively short period, typically six to twelve months, unless supported by consistent programming and maintenance efforts. In

this study, the post-intervention observation period was limited to three months, capturing only the early phase of the intervention's lifecycle. This timeframe provides valuable insights into immediate spatial and behavioral changes but leaves the long-term sustainability of these improvements as an open question for future research. Despite this limitation, the observed strong correlation between syntactic enhancements and behavioral responses indicates that well-designed temporary interventions have the potential to create meaningful and lasting shifts in spatial usage patterns [3]. These changes may persist even after the physical components of the intervention are removed, suggesting that structural improvements in spatial design can have enduring impacts. Further investigation into the mechanisms that sustain these changes over extended periods is essential to fully understand the broader implications of temporary urban interventions and their role in fostering sustainable urban development.

6. Conclusions and Recommendations

This study provides quantitative evidence that temporary landscape interventions can substantially enhance community spatial vitality. The findings underscore the transformative potential of small-scale physical modifications in urban environments, demonstrating their ability to foster increased social interaction and stationary activities. By focusing on spatial dynamics and behavioral outcomes, this research highlights the importance of integrating design strategies that prioritize community engagement and spatial optimization. These results serve as a foundation for further exploration into how temporary interventions can be leveraged to address broader urban challenges, such as social isolation, underutilized spaces, and inequitable access to recreational areas.

1. Temporary landscape interventions produced significant increases in all categories of stationary and social activities, with social interaction frequency rising by an average of 264.9% across the three communities. This dramatic improvement illustrates the capacity of targeted design changes to activate underutilized spaces and foster vibrant social ecosystems. The observed increase in social interactions suggests that such interventions can play a pivotal role in strengthening community bonds and enhancing the overall quality of urban life. These findings also emphasize the importance of tailoring interventions to the specific spatial and social needs of individual communities to maximize their impact.
2. Space syntax analysis confirmed substantial improvements in spatial integration (+65.9%) and intelligibility (+42.3%), demonstrating that even small-scale physical modifications can meaningfully alter the configurational properties of community spaces. These metrics provide robust evidence of the effectiveness of spatial interventions in enhancing the functional and perceptual connectivity of urban environments. Improved spatial integration facilitates smoother movement patterns and greater accessibility, while enhanced intelligibility ensures that spaces are easier to navigate and understand. Together, these changes contribute to a more inclusive and dynamic urban fabric, underscoring the critical role of spatial analysis tools in guiding effective design practices.
3. A strong positive correlation ($R^2 = 0.876$, $p < 0.01$) between integration values and activity frequency validates space syntax as a predictive tool for assessing the behavioral impact of landscape interventions. This correlation highlights the interplay between spatial configuration and human behavior, providing a quantitative framework for evaluating the success of design strategies. By leveraging predictive models, practitioners can optimize interventions to achieve desired outcomes, such as increased social engagement and activity diversity. These findings also open avenues for further research into the application of space syntax in diverse urban contexts, enabling more targeted and effective design solutions.

Based on these findings, the following design recommendations are proposed for practitioners and policymakers: prioritizing spatial connectivity, diversifying activity affordances, adopting community-responsive design, and planning for temporal transitions. These recommendations aim to guide the development of interventions that

not only address immediate spatial and social needs but also contribute to long-term urban resilience. By emphasizing adaptability and inclusivity, these strategies ensure that temporary interventions can evolve into sustainable solutions that reflect the dynamic needs of communities. Policymakers and designers are encouraged to integrate these principles into broader urban planning frameworks to maximize their impact and scalability.

1. **Prioritize spatial connectivity.** Interventions should be designed to improve visual and physical permeability, creating clear sightlines and accessible pathways that integrate new activity zones with existing circulation networks. Enhanced connectivity fosters seamless movement and interaction, ensuring that spaces are both functional and inviting. This approach not only improves the usability of urban environments but also promotes equitable access to recreational and social opportunities. By prioritizing connectivity, designers can create spaces that are more inclusive and conducive to community engagement, ultimately enhancing the overall vitality of urban areas.
2. **Diversify activity affordances.** The inclusion of multiple functional elements, such as seating, play equipment, and fitness facilities, supports a broader range of user groups and activity types, contributing to higher overall vitality. This strategy ensures that interventions cater to diverse demographic needs, fostering inclusivity and encouraging sustained use of the space. By providing varied affordances, designers can create environments that accommodate different preferences and lifestyles, thereby enhancing the adaptability and appeal of urban spaces. This approach also promotes physical and social well-being, making it a cornerstone of effective urban design.
3. **Adopt community-responsive design.** Site selection and programmatic content should be informed by local demographic characteristics and resident preferences, as demonstrated by the differential effectiveness of the three intervention types in this study. This approach ensures that interventions are tailored to the unique needs and aspirations of the community, maximizing their relevance and impact. By engaging residents in the design process, practitioners can foster a sense of ownership and collaboration, enhancing the sustainability and acceptance of the intervention. Community-responsive design is essential for creating spaces that truly reflect and support the people they serve.
4. **Plan for temporal transitions.** Temporary interventions should be conceived as incremental steps toward permanent improvement, with built-in mechanisms for community feedback and adaptive redesign over time. This approach ensures that interventions remain responsive to evolving needs and conditions, fostering long-term resilience and adaptability. By integrating feedback loops and phased implementation strategies, designers can create spaces that continuously improve and adapt to the changing dynamics of urban life. Temporal transitions also provide opportunities for experimentation and innovation, enabling practitioners to refine their approaches and achieve more impactful outcomes.

This study has several limitations. The observation period was relatively short (three months post-intervention), and the research was conducted in a single city, limiting the generalizability of the findings. Future research should extend the temporal scope of evaluation, incorporate physiological and psychological measures of well-being, and examine the transferability of the proposed framework across different geographic and cultural contexts. Expanding the scope of analysis will provide deeper insights into the long-term effects of temporary interventions and their potential to address diverse urban challenges. Additionally, exploring interdisciplinary methodologies can enrich the understanding of how spatial and social dynamics interact, paving the way for more holistic and impactful urban design strategies.

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